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Construction and Application Study of Postoperative Nursing Intervention Program for Osteoporotic Vertebral Compression Fractures

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Abstract: *Objective:* To explore the construction and application effect of a postoperative nursing intervention program for osteoporotic vertebral compression fractures. *Methods:* A total of 68 cases of osteoporotic vertebral compression fractures treated with vertebroplasty in our hospital from March 2023 to April 2024 were selected and randomly divided into the control group and the constructed program group, with 34 cases in each group. The control group received routine postoperative nursing after vertebroplasty, while the constructed program group was provided with a targeted postoperative nursing intervention program based on the control group, which was implemented postoperatively. The postoperative outcomes and thoracolumbar dysfunction of the two groups were compared. *Results:* The total postoperative efficacy rate in the constructed program group (97.06%, 33/34) was significantly higher than that in the control group (76.47%, 26/34) ($P < 0.05$). The thoracolumbar dysfunction score in the constructed program group (15.02 ± 1.36) was significantly lower than that in the control group (22.56 ± 2.41) ($P < 0.05$). *Conclusion:* Constructing a targeted nursing intervention program based on the postoperative nursing requirements for osteoporotic vertebral compression fractures and individual patient characteristics can effectively improve thoracolumbar dysfunction and enhance the postoperative surgical outcome. The clinical application of this program is reliable.

Keywords: Osteoporosis; Vertebral compression fracture; Postoperative nursing; Intervention program; Application effect

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1. Introduction

In recent years, the incidence of osteoporotic fractures has shown an increasing trend year by year, mainly due to the aggravation of population aging, which has led to a yearly rise in the incidence of fracture types such as osteoporotic vertebral compression fractures. This necessitates active improvement of prevention and control measures [1]. At present, the field of orthopedics has developed relatively comprehensive treatment methods for osteoporotic vertebral compression fractures, primarily using surgical methods such as vertebroplasty

to reconstruct the vertebral anatomical structure and restore vertebral function. However, the postoperative recovery period for patients is relatively long, requiring standardized treatment and intervention to improve postoperative vertebral function, alleviate osteoporosis, and reduce the risk of postoperative refracture [2]. Postoperative nursing care requirements for such fractures are high, and there are significant individual differences among patients, so routine nursing measures cannot meet all patient needs. It is therefore necessary to actively optimize postoperative nursing plans and construct individualized and comprehensive postoperative nursing programs for patients [3]. In light of this, our hospital developed a targeted postoperative nursing intervention program for patients based on the characteristics of osteoporotic vertebral compression fractures and the postoperative nursing requirements for vertebroplasty. We selected 68 cases of osteoporotic vertebral compression fractures treated with vertebroplasty in our hospital from March 2023 to April 2024 to compare and analyze the application value of this postoperative nursing intervention program.

2. Materials and methods

2.1. General information

A total of 68 cases of osteoporotic vertebral compression fractures treated with vertebroplasty in our hospital from March 2023 to April 2024 were selected and randomly divided into the control group and the constructed program group, with 34 cases in each. In the constructed program group, there were 19 males and 15 females, aged 63 to 75 years, with an average age of 65.38 ± 3.86 years; the duration of osteoporosis ranged from 1 to 6 years, with an average of 4.56 ± 0.83 years. In the control group, there were 20 males and 14 females, aged 62 to 75 years, with an average age of 65.41 ± 3.91 years; the duration of osteoporosis ranged from 1 to 6 years, with an average of 4.59 ± 0.85 years. The general information of the two groups is comparable ($P > 0.05$). This study was approved by the hospital ethics committee.

2.2. Inclusion and exclusion criteria

Inclusion criteria: (1) Patients diagnosed with osteoporotic vertebral compression fractures via MRI or CT; (2) met the indications for vertebroplasty; (3) first-time vertebral fracture cases; (4) complete patient data and stable physical signs; (5) all patients signed informed consent forms. Exclusion criteria: (1) Combined with vertebral burst fractures, spinal cord injury, or spinal stenosis; (2) combined with acute infectious diseases; (3) combined with spinal tumors; (4) secondary osteoporosis; (5) combined with rheumatic diseases; (6) long-term use of steroid medications.

2.3. Methods

The control group received routine postoperative nursing after vertebroplasty, observing incision recovery, guiding standard osteoporosis medication treatment, closely monitoring the condition, providing dietary guidance, explaining postoperative rehabilitation points and main measures, and discussing precautions before discharge. The constructed program group received a targeted postoperative nursing intervention program in addition to the measures given to the control group, as follows:

(1) Early postoperative targeted intervention: Postoperatively, the pain status was closely monitored, and the patient's limb position was adjusted to alleviate pain. Within 24 hours post-surgery, local ice application was applied to the wound area, placing a towel on the lateral lumbar side and a soft ice pack

for local cooling. Intermittent ice treatment was administered 24 to 72 hours post-surgery to reduce wound swelling and oozing, relieving early postoperative pain. The peripheral temperature of the patient's limbs was monitored, with warm infusion fluids to facilitate body temperature recovery. A soft pillow was placed on the patient's chest, helping them adjust to a prone position so the spine remained level, which promoted recovery.

(2) Postoperative cognitive intervention: A structured discussion with the patient and family members explained osteoporosis mechanisms and principles, highlighting the close relationship between osteoporosis and vertebral fractures. Patients and family members were guided to recognize the importance of osteoporosis treatment, actively preventing re-fracture, and improving postoperative quality of life. Additionally, the recovery points and rehabilitation process, in line with the patient's surgical and pharmacological treatment plan, were clarified to encourage cooperation with nursing and treatment to reduce poor prognosis risks and alleviate postoperative discomfort. Using video, models, and illustrative tools, the postoperative recovery process and treatment requirements were demonstrated, encouraging patients to ask questions and patiently addressing any misunderstandings.

(3) Psychological nursing: Active communication with patients was maintained to monitor emotional states, promptly identifying abnormalities. Patients were encouraged to express concerns, with patients listening to their needs, analyzing psychological issues, and providing targeted psychological counseling to alleviate negative emotional responses. Techniques like deep breathing and meditation were suggested to help relax. Light music or the patient's favorite entertainment could be played in their room or at home to foster a positive environment, distracting from postoperative anxiety or depression.

(4) Individualized rehabilitation guidance: A rehabilitation management team consisting of nursing staff, attending physicians, physical therapists, and rehabilitation physicians was formed to develop a rehabilitation plan. In the early stages, patients were guided to perform appropriate limb movements in bed to improve flexibility and prevent muscle atrophy. Recovery progress was closely monitored, with guidance on aerobic exercises and strength training such as ankle pumps and limb muscle contraction exercises. Patients were encouraged to get out of bed as soon as possible to prevent deep vein thrombosis, with functional training targeting any mobility issues. For lower limb resistance training, knee extensions, and leg lifts were suggested; after fracture healing, balance training with support braces and back muscle strengthening exercises were incorporated. Patients were instructed on the requirements of each rehabilitation stage and encouraged to continue at-home exercises, focusing on strengthening back and abdominal muscles and enhancing overall balance.

(5) Lifestyle guidance: Patients were guided to adopt a healthy lifestyle with moderate exercise and adequate sleep to aid recovery and improve osteoporosis. Based on individual recovery conditions, patients were encouraged to choose preferred forms of exercise, engaging in frequent short-duration sessions daily to improve muscle strength and bone density. Dietary adjustments were recommended, emphasizing a balanced diet with increased intake of high-calcium and high-protein foods. Protein sources such as beef, pork, fish, shrimp, and eggs were recommended, along with high-calcium foods like milk, shrimp shells, and sesame seeds. Fresh vegetables and fruits were suggested to increase vitamins and trace elements. Regular check-ups were encouraged to monitor nutritional indicators, with supplements like calcium and iron added under medical guidance to improve bone density and calcium

status.

(6) Postoperative continuity of care: Before discharge, an individual health file was created for each patient, including personal and clinical treatment information. Communication methods after discharge were specified, including home and personal contact numbers. Patients were invited to join a WeChat group for ongoing communication. Postoperative symptoms and care points were explained, correcting any misunderstandings, and patients were guided to choose firm mattresses or hard beds for spinal support, improving recovery. Follow-ups via WeChat or phone were conducted to monitor recovery, reminding patients of regular check-ups and assisting with adjustments in rehabilitation to improve spinal function.

2.4. Observation indicators

(1) Efficacy evaluation: Three months post-surgery, patient clinical efficacy was evaluated according to the "Expert Consensus on Diagnosis and Treatment of Osteoporotic Vertebral Compression Fractures (2021 Edition)" [4].

(a) Significant efficacy: Fracture healed, lumbar and back pain, and mobility restrictions fully resolved, daily activity restored, and bone density increased by about 50% compared to pre-surgery;

(b) Effective: Fracture healed, bone density increased by 25%–49% compared to pre-surgery, significant or partial improvement in lumbar and back symptoms, and daily activity markedly improved;

(c) Ineffective: Poor fracture healing, bone density improvement of less than 25% compared to pre-surgery, no significant improvement in lumbar and back symptoms, and no improvement in daily activities;

(d) Total effective rate = (Significant efficacy + Effective cases) / total cases × 100%.

(2) Thoracolumbar dysfunction evaluation: The Oswestry Disability Index (ODI) was used to assess vertebral function (0–45 points), with higher scores indicating more severe dysfunction. Preoperative and 3-month postoperative scores were compared between the two groups.

2.5. Statistical analysis

SPSS 20.0 statistical software was used for data analysis, with mean ± standard deviation (SD) for measurement data, analyzed with the *t*-test; count data were represented as [*n* (%)] and analyzed with the χ^2 test. A *P*-value of < 0.05 was considered statistically significant.

3. Results

3.1. Comparison of efficacy

The total effective rate in the constructed program group (97.06%, 33/34) was significantly higher than that in the control group (76.47%, 26/34) ($P < 0.05$). See **Table 1**.

Table 1. Comparison of treatment efficacy between the two groups [*n* (%)]

Group	*n*	Markedly effective	Effective	Ineffective	Total effective rate
Constructed program group	34	19 (55.88)	14 (41.18)	1 (2.94)	33 (97.06)
Control group	34	11 (32.35)	15 (44.12)	8 (23.53)	26 (76.47)
χ^2					5.022
P					0.015

3.2. Comparison of thoracolumbar dysfunction scores

Postoperative thoracolumbar dysfunction scores in both groups were significantly lower than preoperative scores ($P < 0.05$). The postoperative thoracolumbar dysfunction score in the constructed program group (15.02 ± 1.36) was significantly lower than that in the control group (22.56 ± 2.41) ($P < 0.05$). See **Table 2**.

Table 2. Comparison of thoracolumbar dysfunction scores (mean ± SD)

Group	ODI score	
	Pre-operation	Post-operation
Constructed program group	32.25 ± 4.13	15.02 ± 1.36*
Control group	32.21 ± 4.09	22.56 ± 2.41*
t	0.078	5.408
P	0.879	0.014

*Note: Compared with preoperative scores in the same group, $P < 0.05$.

4. Discussion

Osteoporosis is a common disease among the elderly and is a significant risk factor for fractures and disability in this population. With the influence of an aging population, the number of osteoporosis patients in China is rapidly increasing. These patients often experience bone loss and reduced vertebral support, making them more susceptible to vertebral compression fractures from external forces, which severely affects their motor function and quality of life [5]. Surgery is the main treatment method for such vertebral compression fractures, but postoperative rehabilitation demands are high. Long-term, effective nursing support is essential to improve prognosis and enhance the patient's quality of life [6,7].

Currently, clinical nursing research on osteoporotic vertebral compression fractures is increasing, with many studies indicating that conventional nursing models lack personalization and fail to meet the diverse needs of patients. Therefore, there is a need to actively explore highly individualized and targeted nursing plans to assist with postoperative recovery [8,9]. In light of this, the postoperative recovery requirements of such patients were analyzed, and years of experience in postoperative rehabilitation for vertebral compression fractures were summarized to create a patient-centered, personalized, and comprehensive nursing plan. A scientific postoperative nursing intervention plan was constructed accordingly.

This study followed the implementation of this targeted postoperative nursing intervention and found that the total effective rate in the constructed program group (97.06%) was significantly higher than that in

the control group (76.47%). This indicates that constructing and applying a targeted postoperative nursing intervention plan for these patients can effectively improve postoperative lumbar function and osteoporosis symptoms, helping to enhance overall recovery. Furthermore, the study also found that the thoracolumbar dysfunction score in the constructed program group was significantly lower than that of the control group. This suggests that the targeted nursing intervention plan can significantly improve recovery outcomes, promote the correction of thoracolumbar dysfunction, and improve prognosis, making it a reliable approach for clinical application.

5. Conclusion

In conclusion, constructing a targeted nursing intervention plan based on the postoperative nursing requirements for osteoporotic vertebral compression fractures and patient-specific characteristics can effectively improve thoracolumbar function and enhance surgical outcomes, making it a reliable option for clinical application.

Disclosure statement

The authors declare no conflict of interest.

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